

Pressure Testing Procedures for Building Services Piping

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Approved By [REDACTED]

McMurdo, Palmer, and South Pole Stations

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Active Divisions/Departments

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Raytheon Polar Services Company

Facilities, Engineering, Maintenance, and Construction (FEMC)

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Purpose

This procedure outlines the necessary actions and safety practices for hydrostatic pressure testing or air pressure testing all building services piping within heated structures at McMurdo, Palmer, and South Pole Stations.

Responsibility

Plumbing Foreman, Construction Coordinator, Project Engineer, and Field Engineer, FEMC

Personnel

Plumbing Foreman (project or Work Center), FEMC Construction Coordinator, Project Engineer, Field Engineer, NSF Station Manager, NSF Representative

Discussion

In order to ensure the integrity of any building services pipe upon which work has been performed within a heated structure, RPSC will perform pressure testing. For piping that will contain water, brine, seawater, glycol heating solution or CO₂ (due to the high pressure of the test) a hydrostatic test will be used. For piping that will contain air or fuel, RPSC will use pneumatic (air) testing. The pressure testing procedures adopted by RPSC follow API and ASME recommended standards and practices. The procedures also outline proper safety practices that must be followed in order to minimize risks.

Requirements

Tools and Equipment

- All personnel within test area shall be required to wear eye and hearing Personnel Protection Equipment (PPE).
- Air tests will be performed with Chicago quick couplings and an air compressor (currently using Sul-Air Type compressor, exact equipment type may vary).
- Hydrostatic tests will be performed with a high-pressure hydraulic pump and isolation valves that are rated for the pressure and service of the system being tested.

Ensuring Safety of Work Site

Pneumatic and Hydrostatic testing can be dangerous and should be performed with caution and careful attention to all safety procedures. To ensure the safety of all workers and residents, the following safety precautions must be completed prior to conducting the pressure testing:

1. Notify station personnel of area to be avoided due to potential risks during pressure testing.
2. Ensure that no high pressure testing occur in the work centers.
3. Ensure personnel conducting the test stand behind a barrier during pressurization.
4. Mark off the area as a dangerous site, and ensure only individuals associated with the testing activities are in the area.

This information should be provided if the test occurs in normally occupied work area. Occupants must be advised to avoid the area.

Results After following the above prerequisites, the necessary steps to ensure safety will be complete. Proceed to conduct the pressure test.

Conducting the Pressure Test

To conduct a pressure test of building services piping systems in all Station buildings, complete the following steps:

1. Identify the maximum test pressure to be used, as determined by the Project Engineer or Field Engineer.

2. Identify the type of pipe system to be tested.

The maximum aggregate length of pipe to be tested at one time is 400 feet.

3. Examine all connections prior to the test to ensure proper tightness.
4. Determine the pressure rating for all connected fittings and devices to ensure they are rated for the maximum test pressure.
5. Isolate any equipment that may be damaged by the test and indicate this isolation on the test form.
6. Secure a blind flange or cap suitable for the system's rated pressure on all openings that are not closed off by valves.
7. Plug all test, drain, and vent ports that are not required for the test.
8. If the section of pipe being tested is isolated from other sections by in-line valves, ensure the portion not being tested is open to the atmosphere.

For **Pneumatic Testing** follow steps 9 through 15:

9. Apply a preliminary test pressure of 25 psig, or as directed by the Project Engineer.

Note This pressure should be held for a minimum of 10 minutes to allow for the location of any major leaks. If leaks are detected during this step, or at any time during the test, relieve the pressure and take appropriate action to correct the leak. If necessary, consult the Project Engineer for instruction.

10. Apply the test pressure in increments of 25 psig, or as directed by the Project Engineer, until the maximum test pressure is reached. Hold pressure for 5 minutes at each 25 psig increment and inspect for leaks before adding more pressure.

Note The maximum test pressure shall be 150% of the maximum system operating pressure. For systems that derive their pressure from hydrostatic pressure, the required test pressure will be verified prior to testing by the Project Engineer or the Field Engineer.

11. Hold the maximum test pressure for 10 minutes.

The NSF Station Manager or other appropriate NSF representative must observe this step.

12. After the required 10 minutes, reduce the pressure to 100 psi or predetermined pressure.
13. Hold this pressure for 24 hours.
14. Obtain confirmation of a successful test by the NSF representative after the 24 hour time period.
15. Remove the pressure, with caution to avoid escaping air stream, debris, and high decibel noise level.

For **Hydrostatic Testing** follow steps 16 through 23:

16. For McMurdo Station: if water consumption for the hydrostatic test is anticipated to exceed 1000 gallons, notify the Water Plant Supervisor of the pending water consumption. For Palmer Station or South Pole Station: if water consumption for the hydrostatic test is anticipated to exceed 100 gallons, notify the Facility Engineer of the pending water consumption.
17. Fill the piping system with water and apply a preliminary test pressure of 25 psig, or as directed by the Project Engineer. While holding this pressure, purge all remaining air from the piping system and continue to fill with water as necessary to maintain a 25 psig initial fill pressure.

Note This pressure should be held for a minimum of 10 minutes to allow for the location of any major leaks. If leaks are detected during this step, or at any time during the test, relieve the pressure and take appropriate action to correct the leak. If necessary, consult the Project Engineer for instruction.

18. Remove pressure and verify that all air bleed ports are appropriately secured with valves, caps or plugs.

19. Apply the hydrostatic test pressure in increments of 25 psig, or as directed by the Project Engineer, until the maximum test pressure is reached. Hold pressure for 5 minutes at each 25 psig increment and inspect for leaks before adding more pressure.

Note Minimum and Maximum Test Pressures

- The minimum test pressure is 1.5x the design pressure or 100 psig, whichever is greater.
- The maximum test pressure is less than any system component under test.
- CO₂ fire protection system piping test pressure per NFPA 12.

20. Establish that the required test pressure has been achieved.

The NSF Station Manager or other appropriate NSF representative must observe this step.

21. Hold the required pressure for 24 hours or for special projects that are following NSF provided specifications; hold the test pressure for the specified duration of the type of system being tested.
22. Obtain confirmation of a successful test by the NSF representative after the required time period.
23. Remove the pressure, with caution to avoid escaping fluid and debris. Consult waste management for determination of potential hazard of the test fluid before disposal. At McMurdo Station, if appropriate to discharge to waste treatment system, notify the Waste Water Treatment Plant operator prior to release, include contaminants in fluid. If capture of the waste test fluid is appropriate, contact waste management for proper disposal.

For all tests:

24. Complete the appropriate following forms *Pressure/Leak Testing Sheet* (EN-MPS-706a) and/or the *Pressure and Temperature Log* (EN-MPS-706b) and place them in the appropriate engineering files as specified by the Project Engineer.

Results After completing these steps, pressure testing is completed. Once the test is successfully completed, then the piping system is ready for service.

References

ASME B31.9 *Building Services Piping*; 937 – Leak Testing, 1996 Edition

NFPA 12- *Carbon Dioxide Extinguishing Systems*

Pressure/Leak Testing Sheet (EN-MPS-706a)

Pressure and Temperature Log (EN-MPS-706b)

Records

See the “Pressure/Leak Testing Sheet and the Pressure and Temperature Log,” under the FEMC-MPS tab of the *FEMC Records Management Table* (EN-D-226a).

(All forms are located on Common drive I:/Perm/Procedures/Master List/FEMC forms)